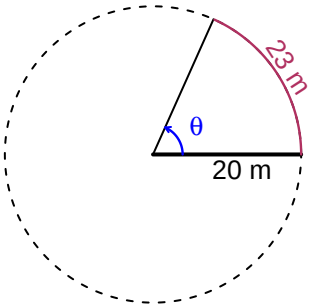
Name: Date:

Trig Final (Solution v37)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 20 meters. The arc length is 23 meters. What is the angle measure in radians?

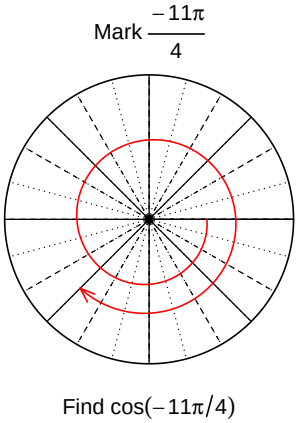


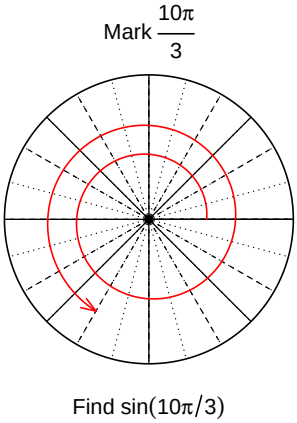
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 1.15$ radians.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).





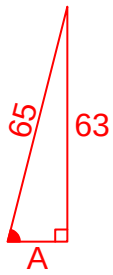
$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{63}{65}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

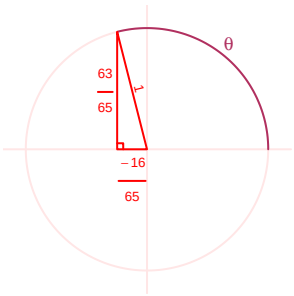
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 63^2 = 65^2$$
$$A = \sqrt{65^2 - 63^2}$$
$$A = 16$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{63}{65}}{\frac{-16}{65}} = \frac{-63}{16}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 4.26 meters, a midline at $y = 5.73$ meters, and a frequency of 7.12 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.26\sin(2\pi 7.12t) + 5.73$$

or

$$y = -4.26\sin(14.24\pi t) + 5.73$$

or

$$y = -4.26\sin(44.74t) + 5.73$$